

**THE SAFEGUARD  
BALLISTIC MISSILE DEFENSE  
SYSTEM**

**DESCRIPTION AND HISTORY**



BALLISTIC MISSILE DEFENSE DEPARTMENT  
US ARMY AIR DEFENSE SCHOOL  
FORT BLISS, TEXAS

18 MAY 1973

## CONTENTS

	Page
HISTORY .....	3
SAFEGUARD SYSTEM COMPONENTS	
Perimeter Acquisition Radar (PAR) .....	8
Missile Site Radar (MSR) .....	9
Data Processing Equipment .....	9
SPARTAN Interceptor Missile .....	10
SPRINT Interceptor Missile .....	11
SITE DEFENSE PROGRAM .....	12
SAFEGUARD SYSTEM TESTS .....	12
A SAFEGUARD ENGAGEMENT .....	12
SAFEGUARD COMPLEX AT GRAND FORKS, NORTH DAKOTA .....	13
CURRENT (1973) STATUS OF BALLISTIC MISSILE DEFENSE DEPLOYMENT .....	14

REPRINTED WITH PERMISSION OF: *Public Information Office  
Safeguard System Command  
Huntsville, Alabama 35807*

# THE SAFEGUARD BALLISTIC MISSILE DEFENSE SYSTEM

## HISTORY

The SAFEGUARD Ballistic Missile Defense (BMD) System now being deployed by the United States Army is an outgrowth of 17 years of ballistic missile defense research and development work by the Army and its contractors. The development program began in the mid-1950's and was known as the Army's NIKE ZEUS project. Under the NIKE ZEUS program, the Army developed a large "acquisition" radar, smaller target tracking and missile tracking radars, a "discrimination" radar to distinguish real warheads from decoys, and the ZEUS interceptor missile. Several prototypes of the radars were built at White Sands Missile Range and the Kwajalein Missile Range in the Pacific Ocean, west of Hawaii. Also, a very large number of ZEUS test missiles were launched at both ranges.

In 1963, the NIKE ZEUS program was reoriented to the NIKE-X project. Phased array radars, which are extremely fast in operation and able to handle numerous targets, simultaneously, replaced the less versatile conventional radars and the SPRINT missile was added as a second interceptor. The following year, in 1964, testing began on a test model of the first phased array radar—called a Multi-function Array Radar (or MAR) at White Sands Missile Range. The two phased array radars in the SAFEGUARD System, the Missile Site Radar (MSR) and the Perimeter Acquisition Radar (PAR), are outgrowths of technology developed in the MAR.

In 1967, a deployment was developed using some of these components which would provide light ballistic missile defense for the entire United States using a small number of strategically located installations.

In September 1967, Secretary of Defense McNamara announced a decision to go ahead on this deployment known as SENTINEL Ballistic Missile Defense System. The primary purpose of the SENTINEL deployment was to provide protection against a possible attack by the Peoples Republic of China. It was to provide in addition a defense against any accidental launch against the United States and an option to defend MINUTEMAN sites.

In February 1969, the Nixon Administration reviewed the SENTINEL deployment and in March 1969, President Nixon announced a modified, phased, 12-site deployment concept. The components of the system, i.e., the radars and missiles, were the same as before, but the manner in which they were to be deployed was different. The name SAFEGUARD was given to the system to denote a basic change in its concept of deployment and to assure this change was widely recognized and understood.

The defense objectives for SAFEGUARD were:

—Protection of our land-based retaliatory forces against a direct attack by the Soviet Union.

—Defense of the American people against the kind of nuclear attack which the Peoples Republic of China is likely to be able to mount within the decade.

—Protection against the possibility of accidental attacks from any source.

#### 1969

During 1969 two MINUTEMAN ICBM fields, Malmstrom AFB, Montana, and Grand Forks, AFB, North Dakota, were chosen for deployment of the first phase of the system. A Perimeter Acquisition Radar (PAR) and a Missile Site Radar (MSR) would be installed at selected locations near each Air Force base. In addition to the SPARTAN and SPRINT missiles at the MSR, additional SPRINT missiles would be installed at Remote Launch Sites (RLS), located near the MSR to enhance the protection of the MINUTEMAN silos. This first phase of the deployment was approved by the Congress in late 1969.

#### 1970

On February 24, 1970 the Secretary of Defense announced the Modified Phase 2 (FY 1971) SAFEGUARD program being proposed to Congress. This proposal was to:

—Continue work at the Grand Forks, North Dakota, and Malmstrom, Montana, complexes.

—Commence deployment at a site in the MINUTEMAN field near Whiteman Air Force Base, Missouri.

—Provide for additional SPRINTs at the Grand Forks and Malmstrom complexes.

—Undertake advanced preparation for deployment at five other sites.

The five sites for which advanced preparation was proposed were:

—Warren AFB in Wyoming.

—In the vicinity of Washington, DC, the National Command Authority (NCA).

—In the Upper Northwest, the Michigan/Ohio Area, and New England.

In late 1970, the Congress approved these portions of the Modified Phase 2 program:

—Continue construction of the two Phase 1 complexes in North Dakota and Montana and add two additional Remote Launch Sites at each location.

—Proceed with preliminary site work, acquisition of real estate and construction of a complex near Whiteman, Missouri. A Missile Site Radar and four Remote Launch Sites are to be deployed in the Whiteman area.

—Perform advanced site preparation (but not commence construction) for an installation near Warren AFB, Wyoming. Advanced preparation includes site surveys, site selection and land acquisition.

#### 1971

On March 9, 1971 the Secretary of Defense announced the FY 1972 SAFEGUARD program being recommended to Congress: This program would provide for:

—Continued construction at the Grand Forks, North Dakota, and Malmstrom, Montana, complexes.

—Beginning construction at the site at Whiteman AFB, Missouri, as authorized in the FY 1971 budget.

—Initial steps toward deployment of a fourth site at either Warren AFB, Wyoming, or in the Washington, DC, area.

In November 1971, Congress authorized continuance of the deployment at Grand Forks and Malmstrom. Also authorized was advanced preparation at the third site, Whiteman, and the fourth site, Warren, for 1972. No authorization beyond study of component configuration for a National Command Authority (NCA) defense system in the Washington, DC, area was given.

#### 1972

On February 17, 1972, the Secretary of Defense outlined the FY 1973 SAFEGUARD program being presented to the Congress. This program consisted of the following:

—Proceed with the planned deployment at the four MINUTEMAN ICBM sites.

—Continue with area defense research and development under SAFEGUARD and the Advanced BMD program.

—Initiate advanced preparations for defense of the NCA at Washington, DC.

—Continue with the Site Defense program. (see page 12)

While the Congress was considering the FY 1973 SAFEGUARD program, President Nixon visited Moscow and on 26 May 1972, the Treaty on the Limitations of Anti-Ballistic Missiles Systems (ABM Treaty) between the US and USSR was signed.

In consonance with the provisions of the Treaty and a directive from the Secretary of Defense, the Army took the following steps:

—Suspended construction of the SAFEGUARD site at Malmstrom, Montana.

—Continued with construction of the SAFEGUARD complex at Grand Forks, North Dakota, as planned.

—Suspended all future work at the Whiteman and Warren sites where advanced preparation was underway.

—Suspended all ABM research and development programs which are prohibited by the ABM Treaty.

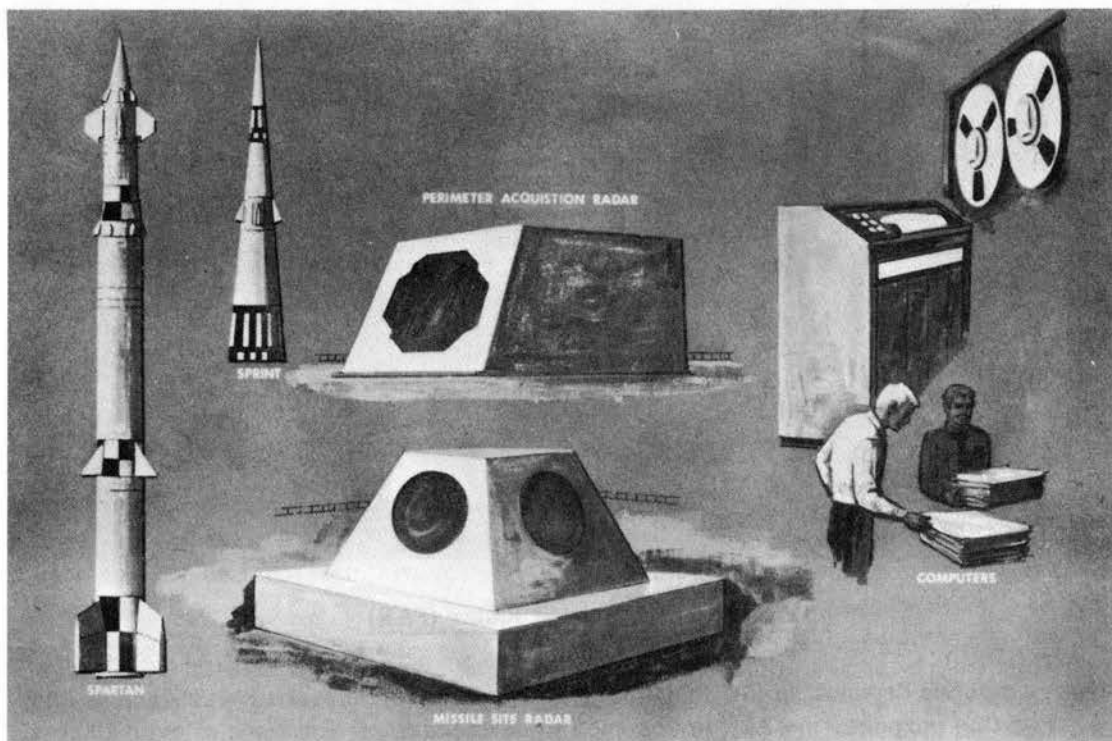
—Started planning for dismantling the Malmstrom site following ratification.

—Initiated planning to (1) cancel the 12-site SAFEGUARD program, and (2) deploy an ABM defense of the National Command Authority (NCA) at Washington, DC, within the provisions of the ABM Treaty on the fastest reasonable schedule.

Because of the ABM Treaty the FY 1973 SAFEGUARD program was reoriented and in June 1972 a modified program was submitted to Congress. This modified program called for authorization to continue work at the SAFEGUARD complex in North Dakota and to begin advanced preparation (but not construction) for the NCA site.

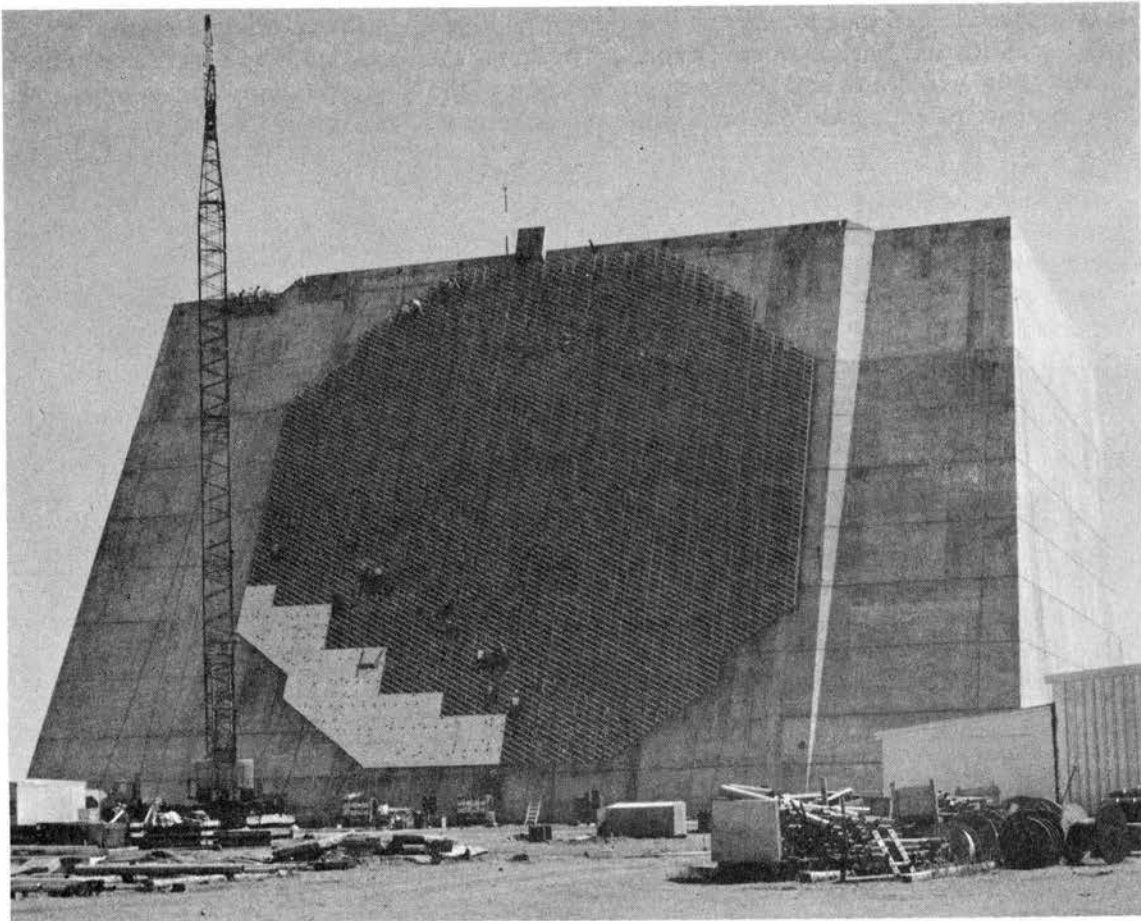
In acting on the FY 1973 Defense Authorization Act in September 1972, the Congress approved the continued deployment of the SAFEGUARD site in North Dakota but withheld approval for advanced preparation for the NCA site at Washington, DC, and directed that

no funds be used to continue or initiate deployment of an anti-ballistic missile system at any site except Grand Forks, North Dakota. The Army then took steps to cancel construction at the Malmstrom site and advanced preparation at the Whiteman and Warren sites, and to terminate procurement of components for sites other than Grand Forks.



### SAFEGUARD SYSTEM COMPONENTS

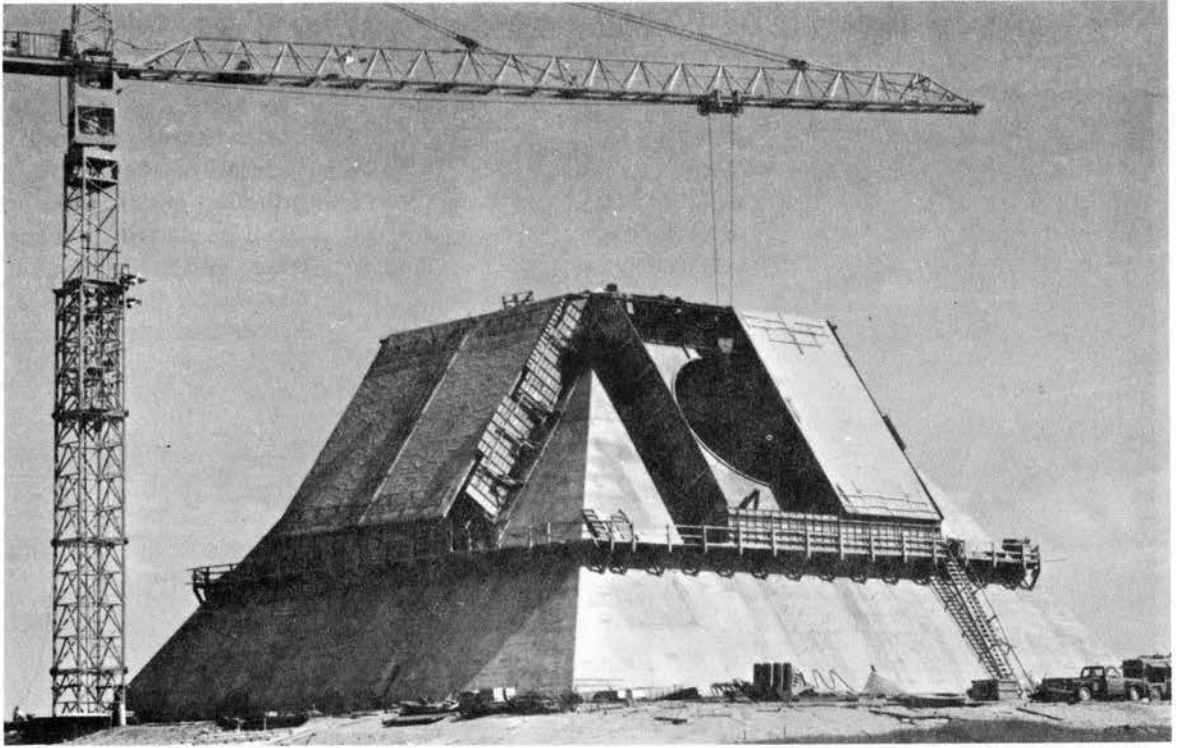
The SAFEGUARD System is made up of two types of radars (the Missile Site Radar and the Perimeter Acquisition Radar); two types of interceptor missiles (the long-range SPARTAN and the short-range SPRINT); a high speed data processing system and communications which will tie these components together into an integrated weapons system permitting man to control the radars and conduct the System's complex engagement planning and execution functions.



### Perimeter Acquisition Radar (PAR)

An effective defense depends on SAFEGUARD's ability to detect attacking warheads at long ranges. For this purpose, the PAR is designed to detect targets at ranges of over 1000 miles. Because a PAR is a "phased array radar" its beams are steered electronically from fixed antennae instead of through the use of a heavy, moving antenna. Unlike a conventional dish-type moving antenna, this phased array radar has thousands of small antennae built into one face of the PAR building. When an attacking warhead is detected by the PAR, its computers determine the ballistic trajectory and relay this information to the MSR. The PAR will be housed in a concrete structure some 200 feet on a side at the base and 130 feet tall which is hardened against nuclear effects. Also located with the PAR will be administrative buildings and an underground power plant. The PAR is being constructed at the operational site near Grand Forks, North Dakota.





Missile Site Radar (MSR)

The other phased array radar employed by the system is the Missile Site Radar (MSR) with a detection range of several hundred miles. It operates in a manner similar to the PAR but provides much more precise, close-in target data. The MSR also readies interceptors for launch and guides them to intercept. SPARTAN and SPRINT missiles are located at the MSR site.

The MSR and its data processing equipment will be housed in an underground building about 230 feet square. On top of the underground MSR building, a fixed turret approximately 75 feet above ground level houses the radar and the four radar antenna faces. In the near vicinity, an underground power plant provides power for radar operation. Additional administrative and support facilities are constructed nearby to provide essential support services. A research and development version of the MSR has been installed at Kwajalein Missile Range in the Marshall Islands, where tests are being conducted. The MSR will have four faces enabling it to operate against attackers from any direction.

#### Data Processing Equipment

Each MSR and PAR will have large capacity data processing centers to operate and communicate with the rest of the system. The data processing centers evaluate the vast amount of information accumulated by the radars and provide the means for man to control the system. The data processing center is composed of computer processors, memory banks, displays, tapes and discs. A significant part of the SAFEGUARD development is the formulation of the computer programs or "software."

## SPARTAN Interceptor Missile

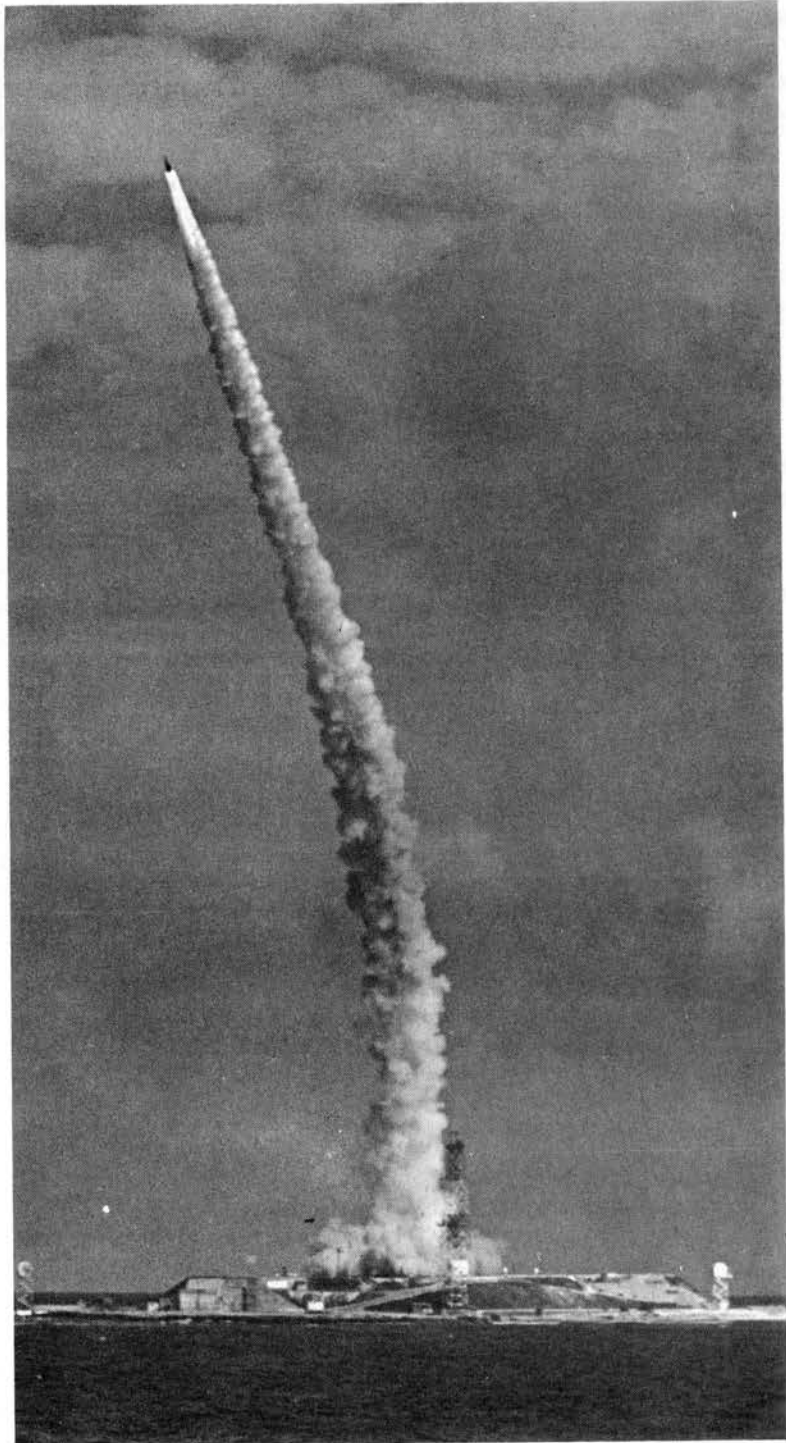


The SPARTAN is a long-range, more powerful version of the ZEUS missile, which was fired successfully many times and made several successful intercepts of ICBMs fired from the West Coast in 1962 and 1963. The ZEUS also successfully demonstrated a satellite intercept capability. The first developmental SPARTAN was fired on March 30, 1968, at Kwajalein.

The 55-foot-long, three-stage, solid propellant missile is launched from an underground cell. The missile is guided to its target by the MSR and its associated data processor. The third stage, which operates outside the atmosphere, is ignited on command from the ground. SPARTAN will carry a nuclear warhead in the megaton range. Development of the warhead is being carried out by the Atomic Energy Commission.

## SPRINT Interceptor Missile

SPRINT is a 27-foot-long, two-stage, solid propellant missile designed to make intercepts at a closer range. It has an extremely high acceleration and is able to reach intercept altitude within seconds after launch. It is also guided to its target by the MSR and its associated data processor. The SPRINT is ejected from an underground cell by a gas propelled piston and its booster ignites once the missile is in the air. The SPRINT will have a nuclear warhead in the kiloton range. It was first test fired on November 15, 1965 and has undergone a large number of test launches.



## SITE DEFENSE PROGRAM

Site Defense is a program to develop a ballistic missile defense system capable of providing terminal defense of MINUTEMAN in the face of a larger and more sophisticated threat than SAFEGUARD was designed to handle. It was authorized by the Deputy Secretary of Defense in January 1971 to develop and demonstrate prototype versions of hardware and software suitable for further development and deployment as a system if required.

Site Defense components consist of phased array radars, their associated data processors and modified SAFEGUARD SPRINT interceptors. The Site Defense radar is similar to the SAFEGUARD MSR, but is smaller and requires less power. The data processor will be an adaptation of a commercial computer. The SPRINT II missile incorporates modifications aimed at reducing operation and maintenance costs.

## SAFEGUARD SYSTEM TESTS

Developmental testing of the SPARTAN and SPRINT missiles has been completed. System tests are now underway at Kwajalein Atoll in the Pacific, using the developmental Missile Site Radar, its associated data processor and interceptor missiles. These tests are performed to verify the integration between these components of the System, i.e., to pick up and track the incoming target nosecone, compute its trajectory, launch the interceptor missile and guide it to intercept—just as would happen in an actual engagement.

There were 16 tests in the first system test series which began in the spring of 1970 and ended in the fall 1971. Of these, 12 were successful while 2 were partially successful and 2 were unsuccessful.

The second series of tests, now underway, began in mid 1971. This series of tests is being conducted with an advanced data processing program which contains more tactical software elements than the previous one and is designed to evaluate the integrated system using more complex intercept geometries which stress specific system functions. Test results as of this date (18 Apr 73) are as follows:

Successful	22
Partially successful	0
Unsuccessful	2

There have been a total of 40 tests in both series.

## A SAFEGUARD ENGAGEMENT

The first element of the SAFEGUARD site to detect an attack would be the PAR. This radar would provide initial track data. The MSR will refine this tracking data, and launch and control the flight of SPARTAN missiles to intercept the incoming warheads. The SPARTANS

kill, a nuclear explosion to destroy or disable the incoming warhead, would occur well out of the atmosphere. A second type of missile, the SPRINT, would be launched to destroy warheads which have penetrated the SPARTAN defense or which may have been allowed to pass into the atmosphere to allow sorting of decoys and warheads. Engagements would be almost entirely automated except for the necessary human decisions which must be made by command authority. All engagement activities are subject to manual intervention at any time.

The nuclear warheads used in the SPARTAN and SPRINT missiles have elaborate safety devices to prevent a nuclear explosion until after the missile is launched and reaches a safe altitude.

### SAFEGUARD COMPLEX AT GRAND FORKS, NORTH DAKOTA

Construction of the SAFEGUARD complex in North Dakota began in the spring of 1970. The major sites in the complex consist of a PAR site, an MSR site with adjacent SPARTAN and SPRINT missile fields and four Remote SPRINT Launch sites.

The PAR site, approximately 250 acres in extent, will have a large radar building and power plant and administrative and troop support facilities. The MSR site, about 425 acres in extent, will also have a large radar building and power plant, administrative and troop support facilities and a family housing area. Each of the four Remote SPRINT Launch sites is about 50 acres in size and will be about 15-25 miles from the MSR site. All of the sites will be self-sufficient with their own water supply and utilities, and will be manned by a small group of highly qualified professional military and civilian personnel.

Construction of the weapons system facilities consisting of PAR building, the MSR building and its adjacent SPARTAN and SPRINT missile fields and two of the four Remote SPRINT Launch sites is now essentially complete. Construction of the remaining two Remote SPRINT Launch sites is expected to be completed by mid-1973.

Installation of tactical radar and missile equipment in the PAR and MSR buildings and the missile fields is now underway and has progressed as shown below:

<u>Weapons System Facility</u>	<u>Percent Tactical Equipment Installed as of 31 March 1973</u>
Perimeter Acquisition Radar Building	89
Missile Site Radar Building	53
Adjacent SPARTAN and SPRINT Fields	Not started
Remote SPRINT Launch Sites	Just started

While the tactical equipment is being installed in each of the weapons systems facilities, testing of individual components and subsystems takes place. Following the installation of the tactical equipment a period of time is required to test and verify the integration between all the components of the System, i.e. the radars, the data processing centers and the missiles. The Equipment Readiness Date for the North Dakota complex is October 1974.

## CURRENT (1973) STATUS OF BALLISTIC MISSILE DEFENSE DEPLOYMENT

On March 26, 1973, the Secretary of Defense outlined the FY 1974 SAFEGUARD program being presented to the Congress. This program consisted of the following:

- Proceed with the completion of the SAFEGUARD site at Grand Forks, North Dakota, for the defense of MINUTEMAN.
- Conduct studies with respect to the national capitol area site to preserve our option to defend the National Command Authorities (NCA) in Washington, DC.
- Pursue a research and development effort on the Site Defense ABM System.

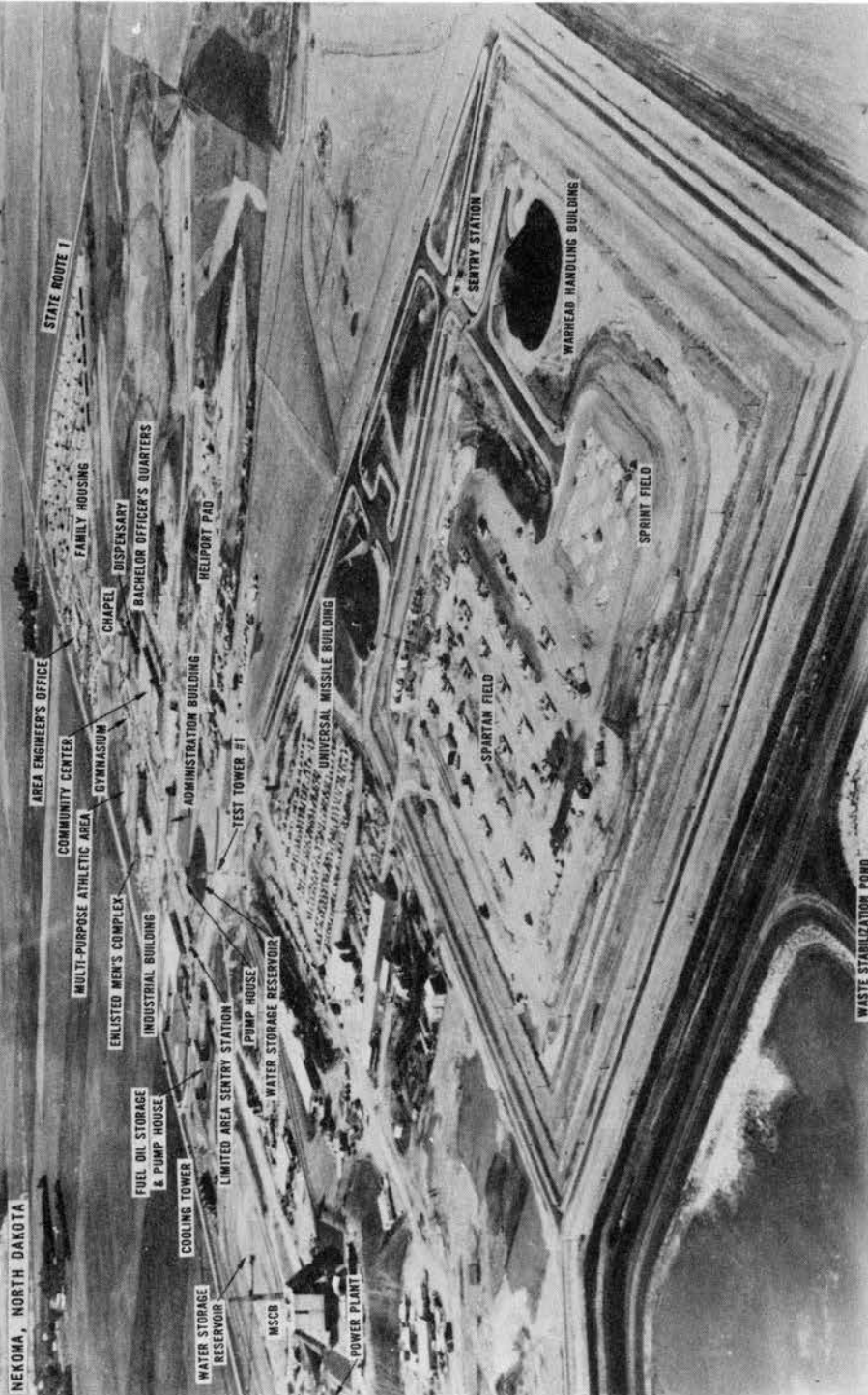
Prepared in response to  
public inquiries regarding  
the SAFEGUARD System.





# MISSILE SITE RADAR SITE NORTH DAKOTA FALL 1972

ALL UNIDENTIFIED STRUCTURES ARE CONTRACTOR CONSTRUCTION FACILITIES



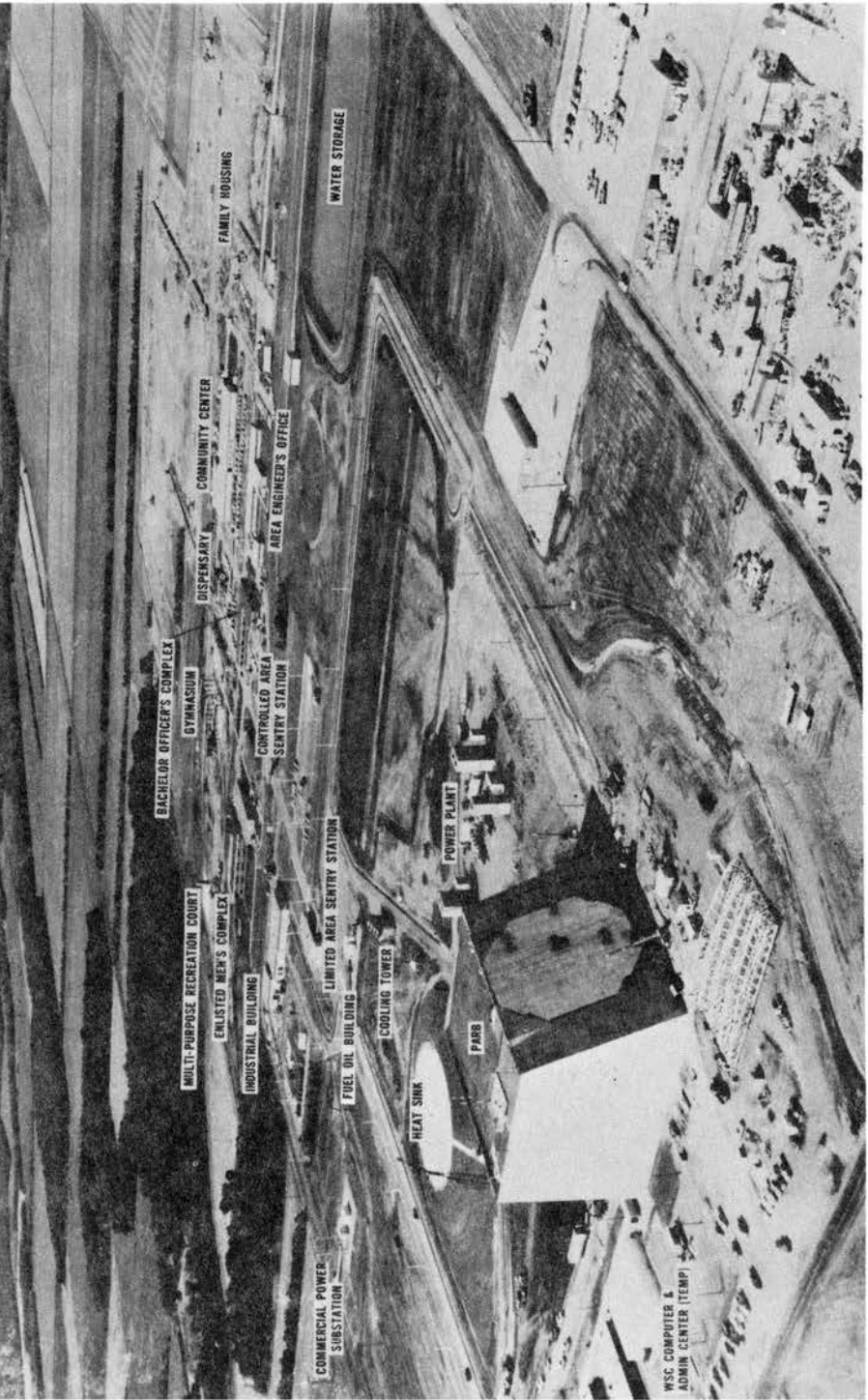


# PERIMETER ACQUISITION RADAR SITE

NORTH DAKOTA

FALL 1972

ALL UNIDENTIFIED STRUCTURES ARE CONTRACTOR CONSTRUCTION FACILITIES



- COMMERCIAL POWER SUBSTATION
- WSC COMPUTER & ADMIN CENTER (TEMP)
- HEAT SINK
- PARB
- POWER PLANT
- COOLING TOWER
- FUEL OIL BUILDING
- LIMITED AREA SENTRY STATION
- INDUSTRIAL BUILDING
- ENLISTED MEN'S COMPLEX
- MULTI-PURPOSE RECREATION COURT
- BACHELOR OFFICER'S COMPLEX
- GYMNASIUM
- DISPENSARY
- COMMUNITY CENTER
- FAMILY HOUSING
- AREA ENGINEER'S OFFICE
- CONTROLLED AREA SENTRY STATION
- WATER STORAGE